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Title: ENVIRONMENTAL SENSOR FOR BLIND PEOPLE

Abstracted Patent: GB2282908

Publication Date: 1995-04-19

Inventor(s): ASH DAVID LEO

Applicant(s): ASH DAVID LEO (GB)

Application Number: GB19930021286 19931015

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IPC Classification: A45B3/00 ; A45B3/08

Equivalents:

ABSTRACT:

An environmental sensor can be attached to, incorporated in or embodied as a probe for use by the blind and partially sighted. A sensing tip 3, connecting means 2 and tactile communicating means contained in a box 1 are attached to the stick 4, enabling detection, regardless of ambient noise or impairment of hearing, of puddles and larger expanses of water when out walking. A timer is included to ensure that the signal from the tactile communicating means is noticeable, even when the duration of sensing is brief. Alternative embodiments of the environmental sensor include devices to provide a tactile indication of the level, depth or temperature of a liquid, or tactile or audible warning of noxious or explosive gas. The connecting means may employ wire, sound, electromagnetic radiation, pneumatics or hydraulics to transmit the signal from the sensing element to the tactile communicating means.

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(56) Documents Cited
GB 2238386 A GB 2167222 A GB 2162980 A
US 4864763 A US 3998950 A US 3906971 A
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UK CL (Edition M) G4N NCLC NDAX
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(54) Environmental sensor for blind people

(57) An environmental sensor can be attached to, incorporated in or embodied as a probe for use by the blind and partially sighted. A sensing tip 3, connecting means 2 and tactile communicating means contained in a box 1 are attached to the stick 4, enabling detection, regardless of ambient noise or impairment of hearing, of puddles and larger expanses of water when out walking. A timer is included to ensure that the signal from the tactile communicating means is noticeable, even when the duration of sensing is brief. Alternative embodiments of the environmental sensor include devices to provide a tactile indication of the level, depth or temperature of a liquid, or tactile or audible warning of noxious or explosive gas. The connecting means may employ wire, sound, electromagnetic radiation, pneumatics or hydraulics to transmit the signal from the sensing element to the tactile communicating means.

Fig 1

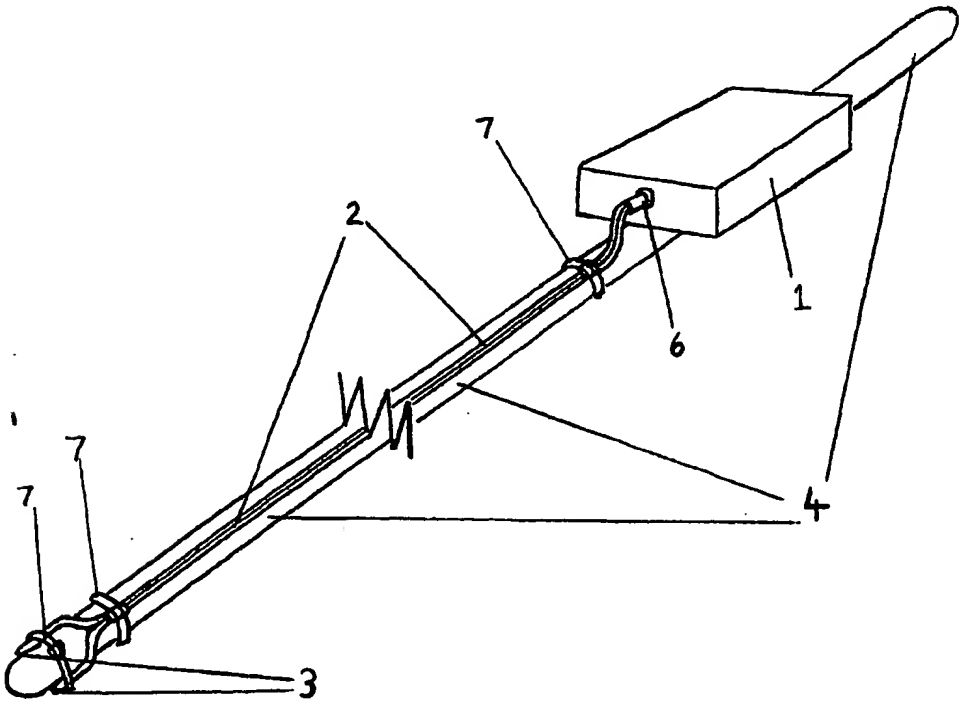

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Fig 1

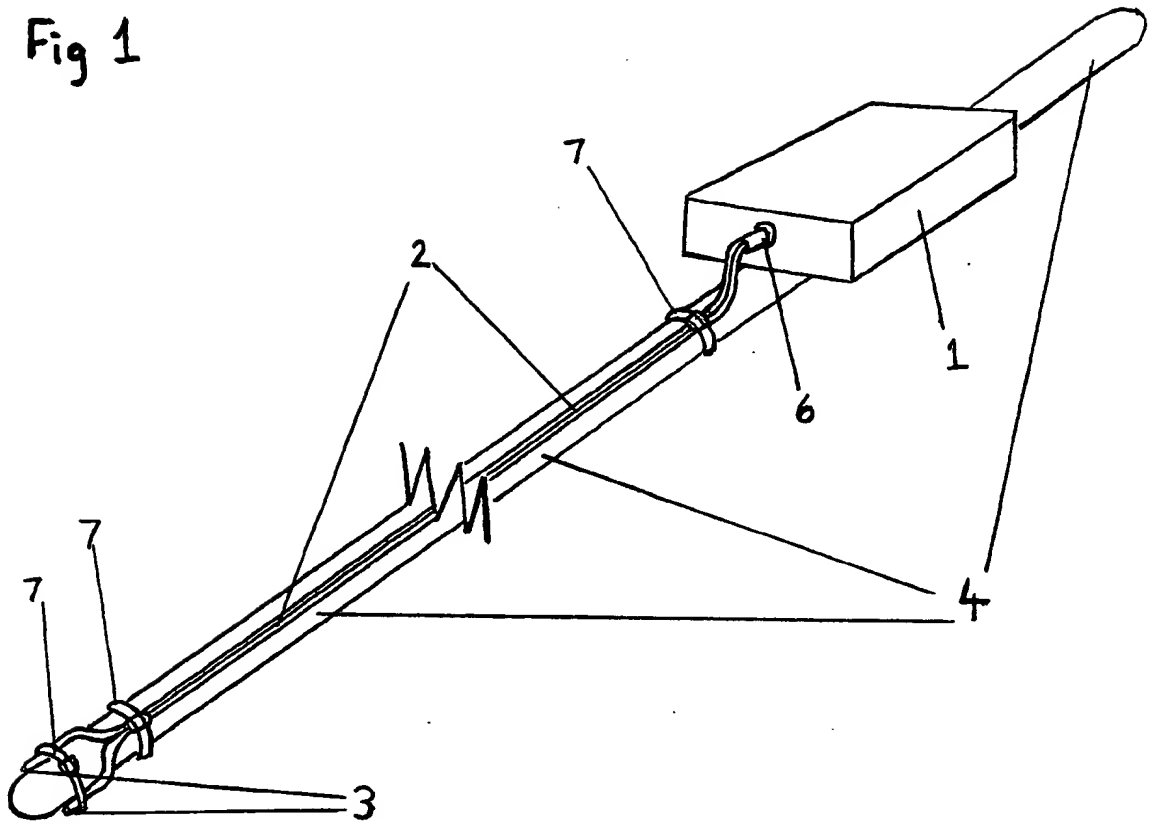


Fig 2

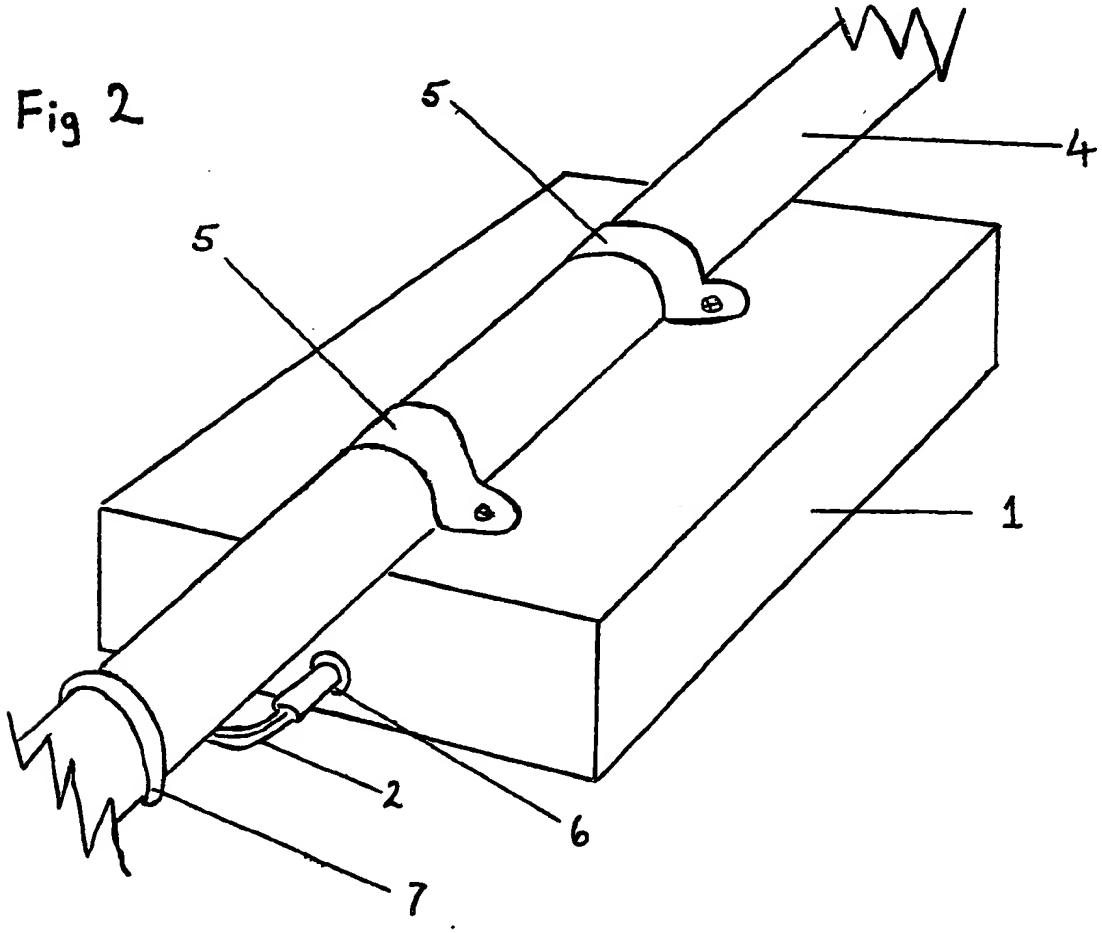


Fig 3

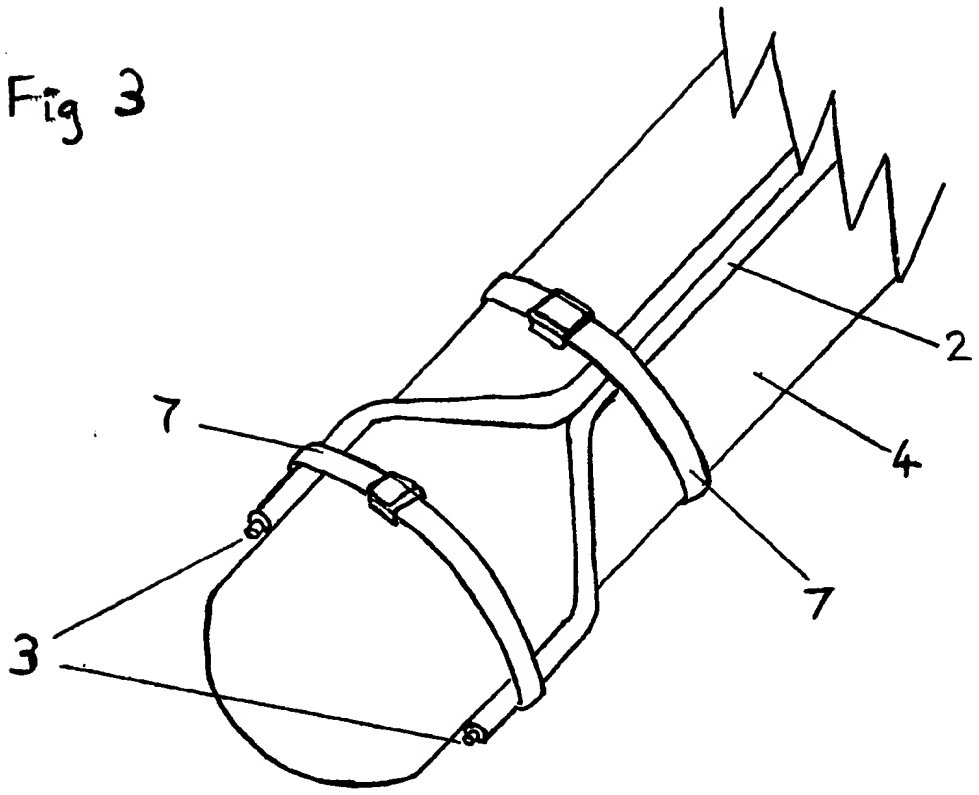


Fig 4

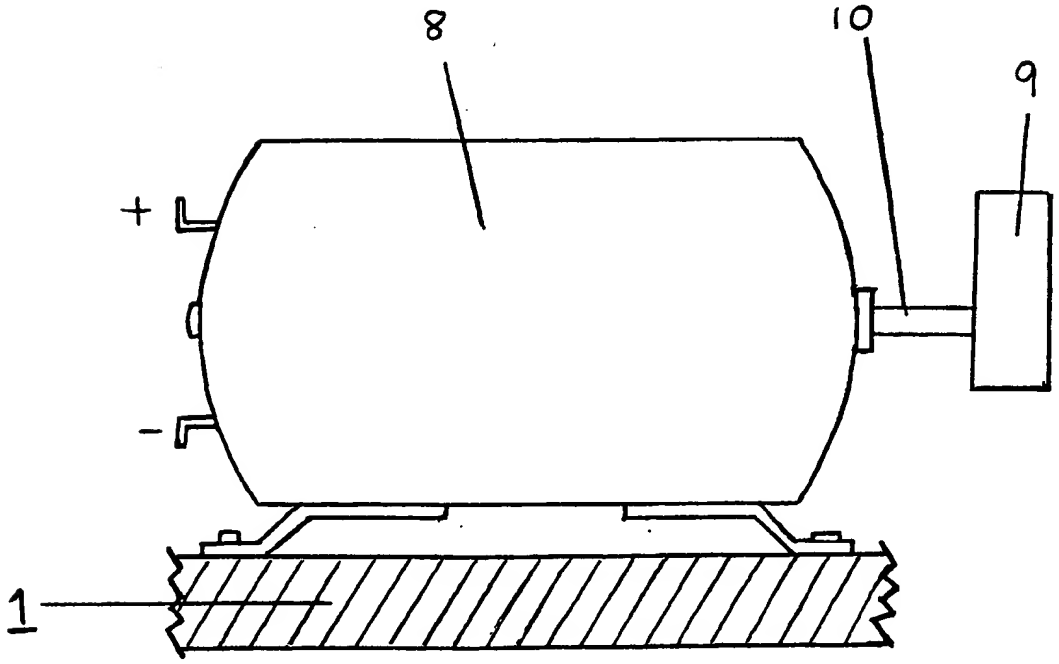
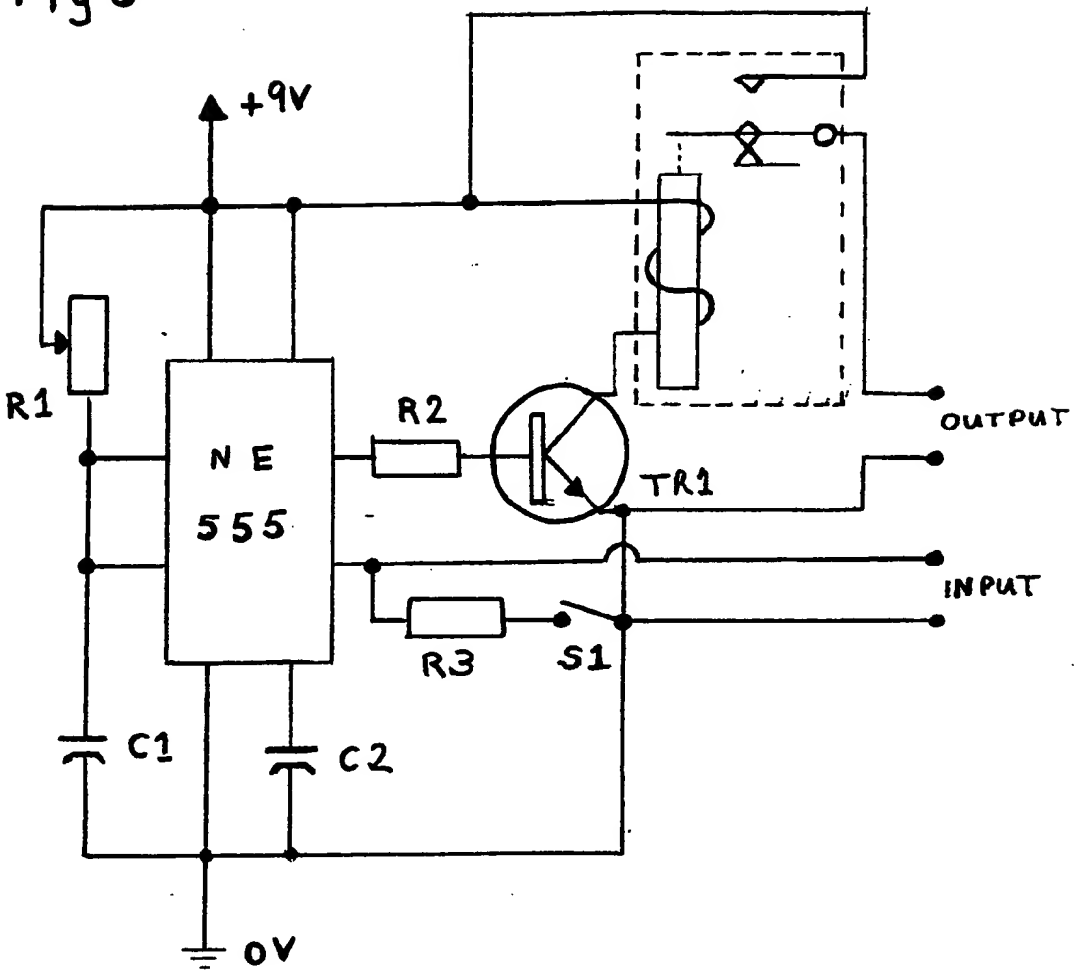


Fig 5



ENVIRONMENTAL SENSOR

This invention relates to environmental sensors. In particular, it relates to observation of environmental phenomena by individuals with impaired ability to see or hear. The invention can be used to detect a range of environmental parameters such as temperature or level of a fluid. However, for convenience, the use of the invention in devices to enable people with impaired vision to detect the presence of water will be described.

It is common knowledge that devices giving visual information or signals are of little or no use to people who are partially sighted or blind. Also, if hearing is impaired, or rendered less efficient by ambient noise, an audible signal is not so effective as it might be.

It is less well known that blind or partially sighted people have considerable difficulty in the detection of puddles or larger expanses of water. The mobility aid they commonly use, the familiar "white cane", is not very efficient in the task of detecting water. Although guide dogs can be trained to guide a blind person around a puddle, they cannot signal why they are making a detour, and not all blind people can have a guide dog.

Alternative methods of "seeing", such as radar or infra-red devices, whilst they can provide useful information, do not appear to be popular with the blind, perhaps because of their relatively ambiguous responses and because of their cost. It is an objective of the current invention to solve the problems experienced by the blind and partially sighted in the detection of the presence of water.

Other objectives are attainable with certain embodiments of the invention, such as the sensing of the level, depth or temperature of an aqueous liquid, or the detection of noxious or explosive gas. Such applications could aid the safety of blind people in such commonplace activities as filling a bath or lighting a gas ring.

The invention can be embodied as or incorporated in, or provided as a kit for mounting on, a stick or probe. The sensing element and signalling device can be directly connected to one another or, with appropriate modifications, they could be remotely connected.

According to the present invention there is provided an environmental sensor comprising a sensing element which generates a response to a particular environmental condition, connecting means, and tactile communicating means arranged so that, when in use, the response generated by the sensing element causes the connecting means to activate the tactile communicating means, producing a tactile indication of the particular environmental condition being sensed.

A specific embodiment of the invention will now be described by way of example, with reference to the accompanying drawing in which:-

Figure 1 shows in perspective, the environmental sensor mounted on a stick;

Figure 2 illustrates a way of attaching the main part of the environmental sensor to the held end of the stick;

Figure 3 shows how a sensing tip may be formed on the stick;

Figure 4 depicts a tactile output generator; and

Figure 5 is an electronic circuit diagram.

Referring to the drawing, the environmental sensor comprises a box 1 and an insulated dual conductor 2, terminating in a sensing tip 3. The whole assembly is attached to a stick 4. The stick can be any of the range used by the blind and partially sighted, when out walking, to detect obstacles and sudden changes in ground level. Addition of the environmental sensor enables the detection of puddles, flooded kerbs, ponds, streams and the like as follows. Potential discomfort, shock and danger can thereby be avoided.

When the sensing tip 3, which is mounted close to the ground-following end of the stick 4, is immersed in water or any other aqueous liquid a small electric current is permitted to flow through the conductor 2. In this example the sensing tip 3 is formed by baring the ends of the conductor 2, separating them so that they cannot be bridged by a drop of water retained on the end of the stick 4, and mounting them so that only water deep enough to be a cause of concern is detected. A current flowing through the conductor 2 causes components in the box 1, which is mounted close to the held end of the stick 4, to generate a vibration which can be felt by the hand holding the stick 4.

Figure 2 illustrates one way of attaching the box 1 to the stick 4, ie by clamps 5. The conductor 2 can be attached to the stick 4 by means of cable ties 7 and electrically connected to the circuitry in the box 1 via a jack plug and socket 6. Figure 3 shows how the sensing tip can be formed.

Figure 4 shows a vibration generator which can be rigidly mounted in the box 1. A small electric motor 8 has mounted on its shaft 10 an eccentric weight 9. Experiment showed that a piece of rubber measuring approximately 1cm by 1cm by 1.5cm mounted off-centre on the motor shaft 10, ie with an imbalance ratio of approximately 2:1, when rotated at a few thousand RPM generated a degree of vibration which was clearly noticeable when transmitted via the box 1 to the stick 4.

Since the current flowing in the conductor 2 is not large enough to power the motor 8, an electronic circuit is also mounted in the box 1. A suitable circuit is shown in figure 5. The circuit can be energised by a battery which can also be mounted in the box 1, with an on/off switch on the outside. This battery could be rechargeable in situ.

Referring to Figure 5, when a small current flows at the INPUT, eg when the contacts of the sensing tip 3 are bridged by water, the NE 555 causes a current to flow through R2 switching on TR1. This energises the relay, permitting a larger current to flow at the OUTPUT. This larger current can be used to energise a vibration generator such as that depicted in Figure 4, or any other suitable tactile communicating means.

When blind and partially sighted people sweep before them with the stick 4, it is possible that immersion of the sensing tip 3 might be only momentary. The resultant tactile output could be too brief or weak to be noticed. This problem is overcome as follows. With reference to Figure 5, R1 determines how long a current flows through R2 when triggered by a current flowing at the INPUT. By pre-setting R1 the current at the OUTPUT is caused to flow for an appropriate length of time after current ceases to flow at the INPUT. Tests confirmed that a vibratory output of a second or two was sufficient to ensure that detection of water was noticed.

A momentary test button, S1 in Figure 5, is mounted on the outside of the box 1. R3 simulates the resistance of water bridging the contacts in the sensing tip 3. When S1 is closed the environmental sensor behaves as though the sensing tip 3 had been immersed in water, providing confirmation that the battery is not exhausted and the unit is functional. The momentary test button and the on/off switch mentioned above were chosen to be dissimilar in form, so that a blind person could feel which is which.

A range of alternative embodiments of this invention are possible. For example:-

(a) the components could be supplied as a unit or kit of parts for attachment to any type of stick;

(b) with any necessary modification to the components and circuitry, they could all be incorporated in or embodied as a ready made water-sensing stick;

(b) the vibratory tactile communicating means described above could be replaced by a moving tactile element, which could either oscillate or simply change position;

(c) a tactile communicating means which changed position could conserve energy if it disconnected the power supply when activated, reconnection being achieved by manual resetting;

(d) a sensing element responsive to the level, temperature or depth of a liquid, or to the presence of noxious or explosive gas could be employed instead of one to detect the presence of water;

(e) sensing elements with a continuously variable output could be combined, via appropriate circuitry, with continuously variable tactile communicating means (such as a variable output vibration generator), thereby providing an indication of the degree of the condition being sensed (eg depth or temperature);

(f) components of any variant of this invention could be more remote from the sensing element, connected either by wire or by an electromagnetic, sonic, pneumatic or hydraulic transmission system to the tactile communicating means, with the latter worn on the body or in clothing.

CLAIMS

1. An environmental sensor comprising a sensing element which generates a response to a particular environmental condition, connecting means, and tactile communicating means arranged so that, when in use, the response generated by the sensing element causes the connecting means to activate the tactile communicating means, producing a tactile indication of the particular environmental condition being sensed.

2. An environmental sensor as claimed in Claim 1 wherein timing means are provided to ensure that, when the sensing element is exposed only momentarily to the particular environmental condition being sensed, the duration of the resultant tactile indication from the tactile communicating means is long enough to be perceived.

3. An environmental sensor as claimed in Claim 1 or Claim 2, wherein the tactile communicating means is a mechanical vibrator, and the tactile indication is a noticeable degree of mechanical vibration.

4. An environmental sensor as claimed in Claim 1 or claim 2, wherein the tactile communicating means is a piston sitting in a socket, the tactile indication being a noticeable movement of the piston in the socket.

5. An environmental sensor as claimed in Claim 4, wherein movement of the piston causes increased protrusion from the socket and causes disconnection of the power source, reconnection being achieved by manual depression of the piston to its normal position.

6. An environmental sensor as claimed in any one of the preceding Claims, wherein the sensing element is responsive to immersion in an aqueous liquid.

7. An environmental sensor as claimed in Claim 6, wherein the response generated by the sensing element is indicative of the depth of immersion.

8. An environmental sensor as claimed in any one of Claims 1 to 5, wherein the sensing element is responsive to temperature.

9. An environmental sensor as claimed in Claim 8, wherein the response generated by the sensing element is indicative of the temperature being sensed.

10. An environmental sensor as claimed in any one of Claims 1 to 5, wherein the sensing element is responsive to the presence of noxious gas.

11. An environmental sensor as claimed in any one of Claims 1 to 5, wherein the sensing element is responsive to the presence of explosive gas.

12. An environmental sensor as claimed in Claim 10 or Claim 11, but wherein audible communicating means are employed in place of the tactile communicating means.

13. An environmental sensor as claimed in any one of the preceding Claims, wherein the sensing element is mounted at the first end of a stick, and the tactile communicating means is mounted at the second end of the stick, and the connecting means are arranged to connect the sensing element to the tactile communicating means.

14. An environmental sensor as claimed in any one of Claims 1 to 12, wherein the environmental sensor, any or part thereof, is incorporated in or embodied as a stick or probe.

15. An environmental sensor as claimed in any one of the preceding Claims, wherein the connecting means transmits the signal from the sensing element to the tactile communicating means by wire, optical fibre, sound, electromagnetic radiation or by pneumatic or hydraulic means.

16. An environmental sensor as claimed in Claim 15, wherein the tactile communicating means can be held or worn, when in use, remote from the sensing element.

17. A kit of parts comprising a sensing element, connecting means and tactile communicating means with which the user's own stick could be customised.

18. A method for enabling a blind person to sense water, whereby a sensing element, connecting means and tactile communicating means are attached to or incorporated in a stick and the stick is swept back and forth so that the user can detect water by means of a tactile indication.

19. A method for enabling a blind person to sense the depth of a liquid, whereby a sensing element is attached to, incorporated in or embodied as a probe or stick, and linked by connecting means to tactile communicating means.

20. A method for enabling a blind person to sense the level of a liquid, whereby a sensing element is attached to, incorporated in or embodied as a probe or stick, and linked by connecting means to tactile communicating means.

21. A method for enabling a blind person to sense the temperature of a liquid, whereby a sensing element is attached to, incorporated in or embodied as a probe or stick, and linked by connecting means to tactile communicating means.

22. A method for enabling a blind person to sense the presence of noxious gas, whereby a sensing element is linked by connecting means to tactile communicating means.

23. A method for enabling a blind person to sense the presence of explosive gas, whereby a sensing element is linked by connecting means to tactile communicating means.

24. A method as claimed in Claim 22 or 23, but employing audible communicating means instead of tactile communicating means.

25. An environmental sensor substantially as described herein with reference to Figures 1-5 of the accompanying drawing.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 - 10 -
(The Search report)

Application number
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Relevant Technical Fields

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(ii) Int Cl (Ed.5) A45B 3/00, 3/08; A61H 3/06

Search Examiner
D SUMMERHAYES

Date of completion of Search
20 DECEMBER 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
1-25

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2238386 A	(EDEN)	1, 13, 15
X	GB 2167222 A	(DRAGERWERK)	1, 16
X	GB 2162980 A	(MURPHY)	1, 3, 6, 12, 15, 16
X	US 4864763	(PEIKIN)	1, 3, 8, 9, 12, 13, 14, 15, 17, 21
X	US 3996950	(MIER)	1, 3, 4, 12
X	US 3906971	(BURNSTINE)	1, 6, 13, 14, 18
	WPI Abstract Accession no 88-300560/43 and DE 3711499 (STUHRENBERG) 20 October 1988 see abstract		1, 12, 13, 14, 15

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